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GB 1294151
GB 820465
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1DA

(54) Thief Resistant Insulated Window Shutter

(57) A laminated window shutter comprises two sheets of insulating material 16, 17 bonded to an expanded or perforated sheet 18 of steel or aluminium. The sheet 18 may have a flange 22 and be riveted to a T-shaped section 19. The sheets 16, 17 may be made of wood-fibre, flexible expanded plastics, rigid polystyrene or polyurethane and have a covering 20, 21 of wall paper, vinyl or be painted or veneered. A strip of fabric 23 runs under the layer 20, 21 to provide a flexible hinge connection.

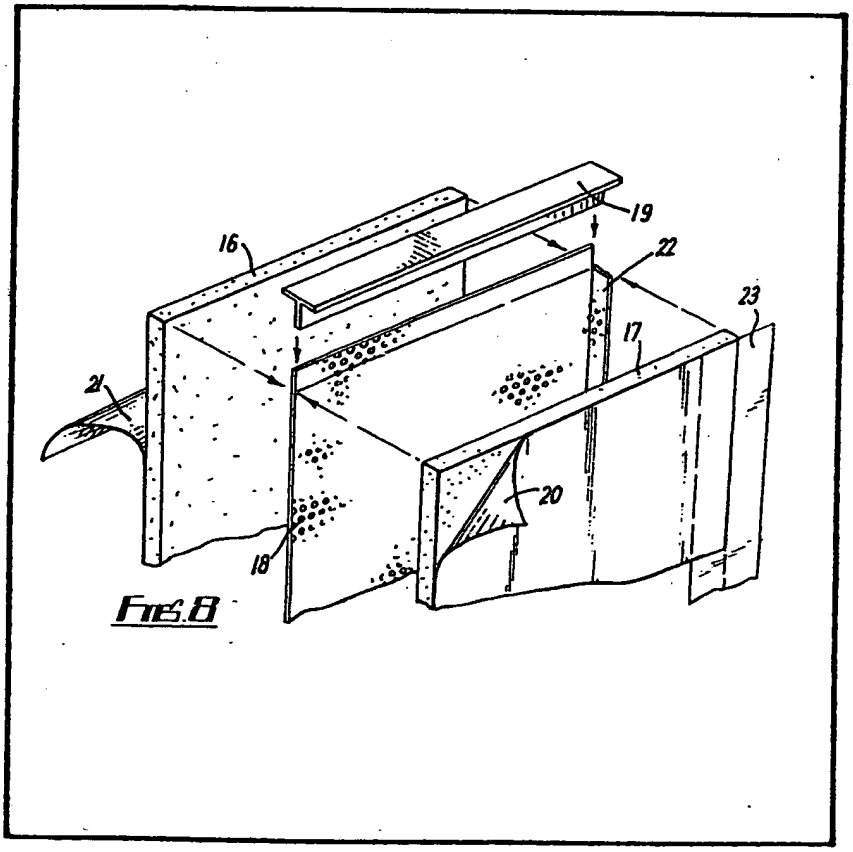

FIG.8

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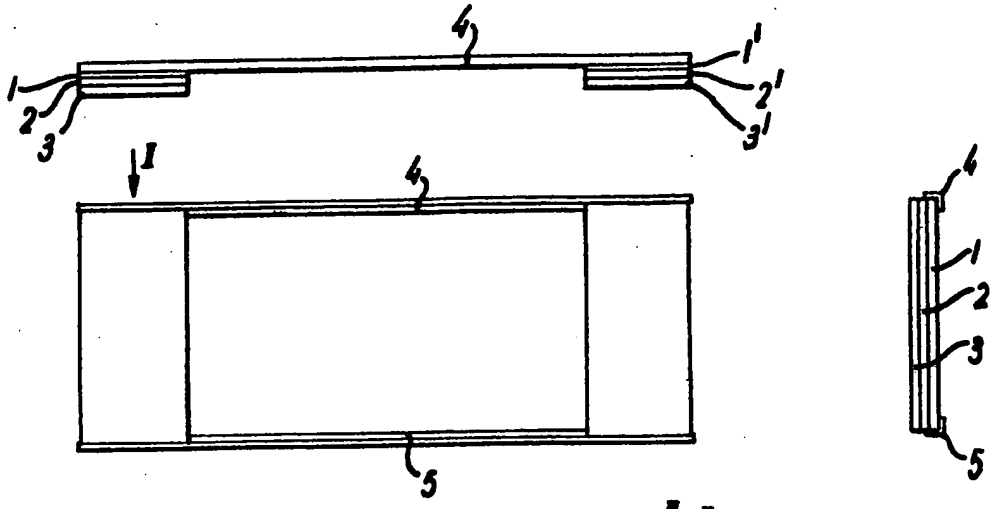

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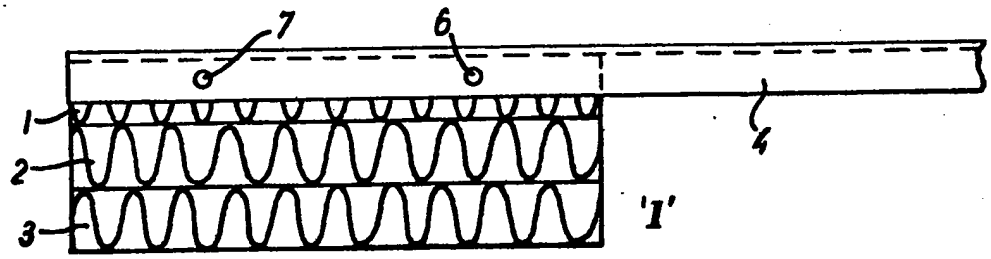

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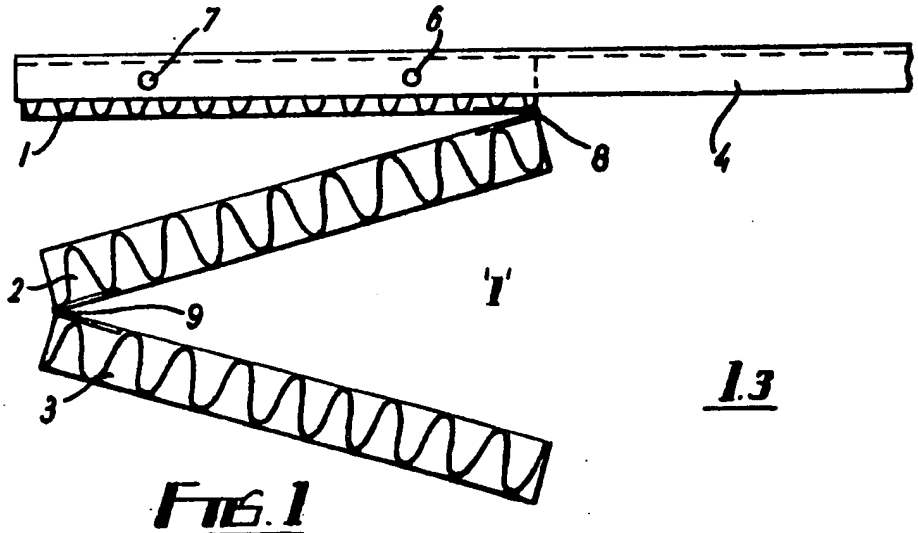
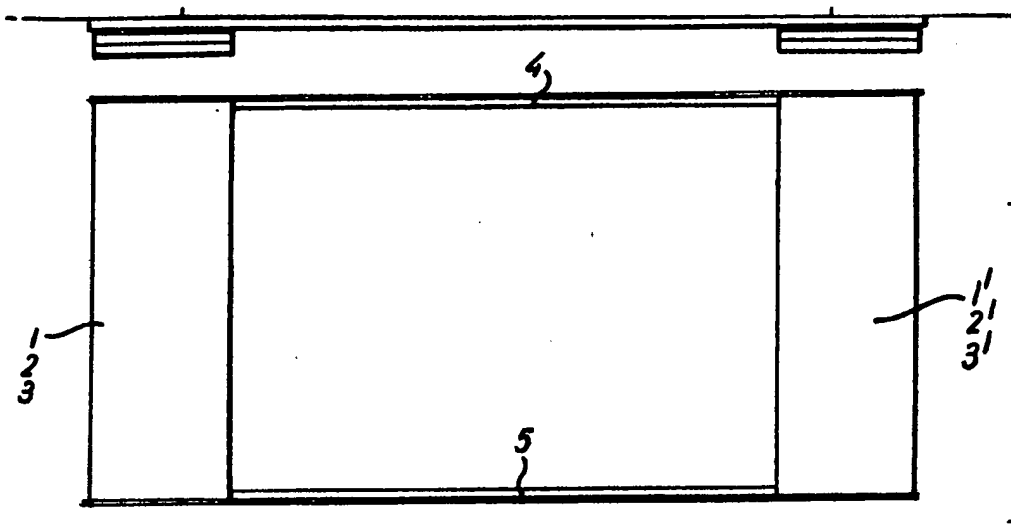


1.3

FIG. 1



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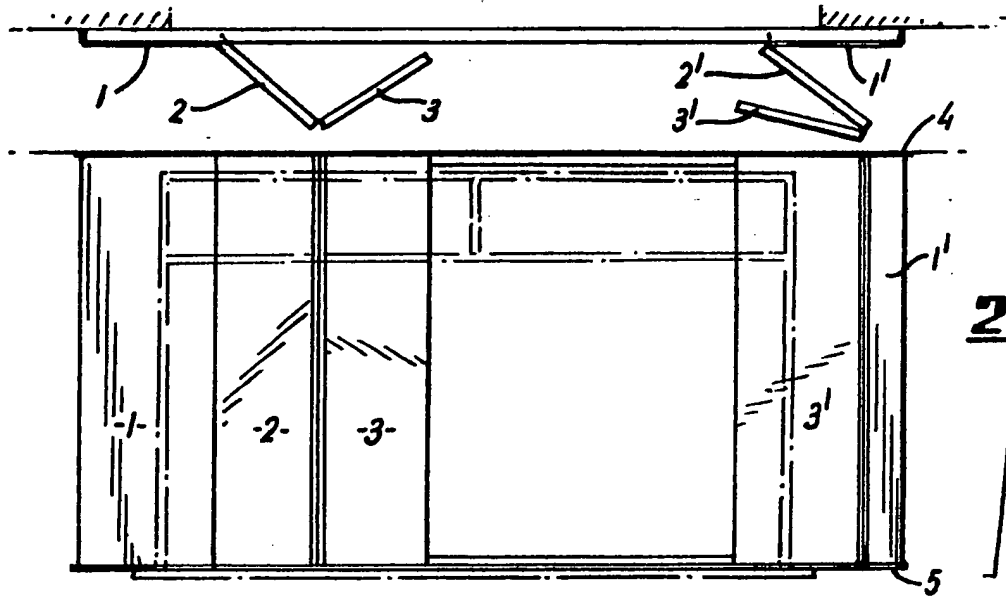

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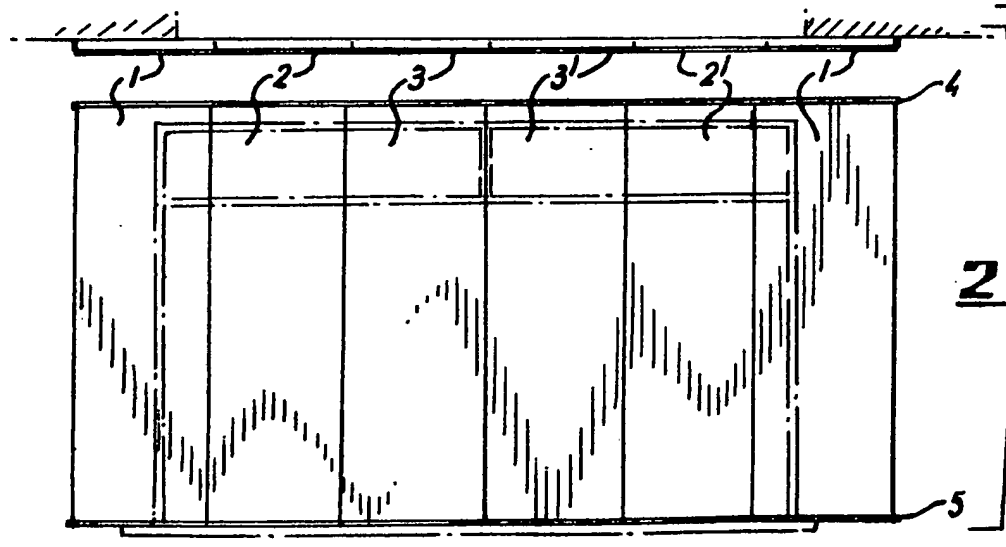

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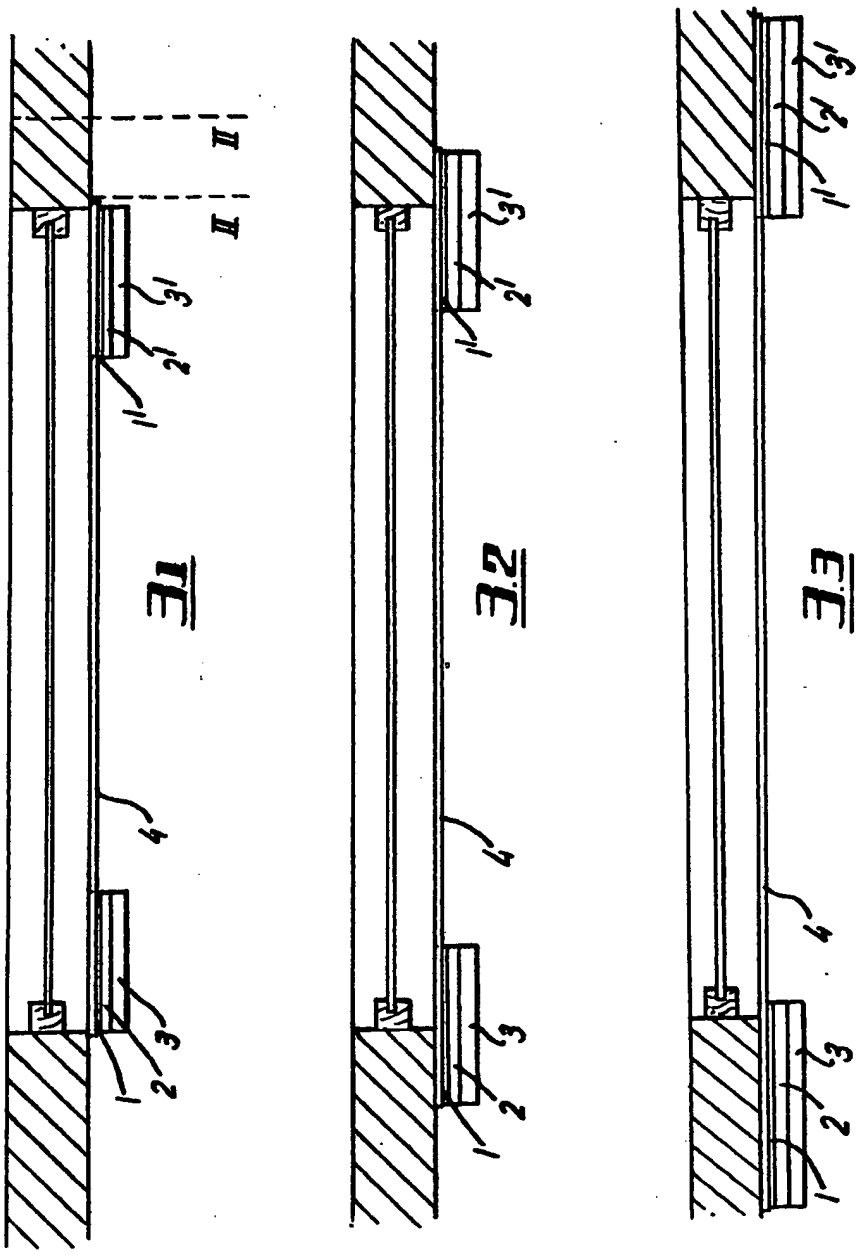
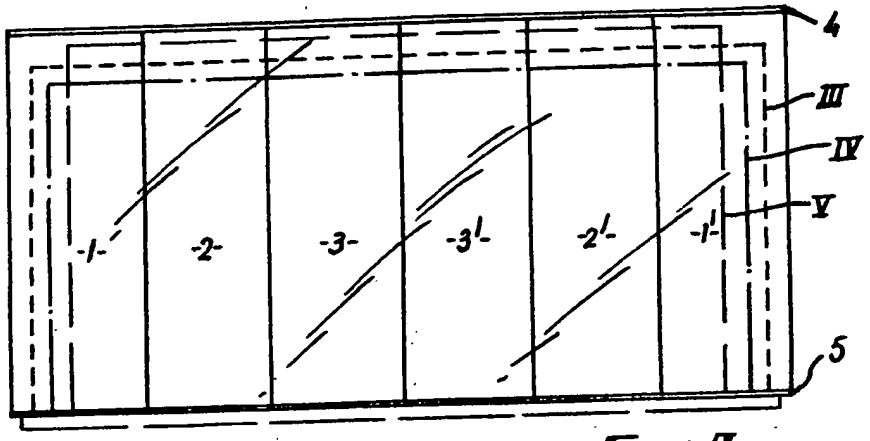
Fig.3





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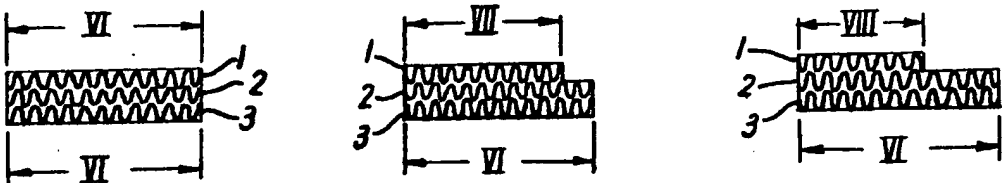
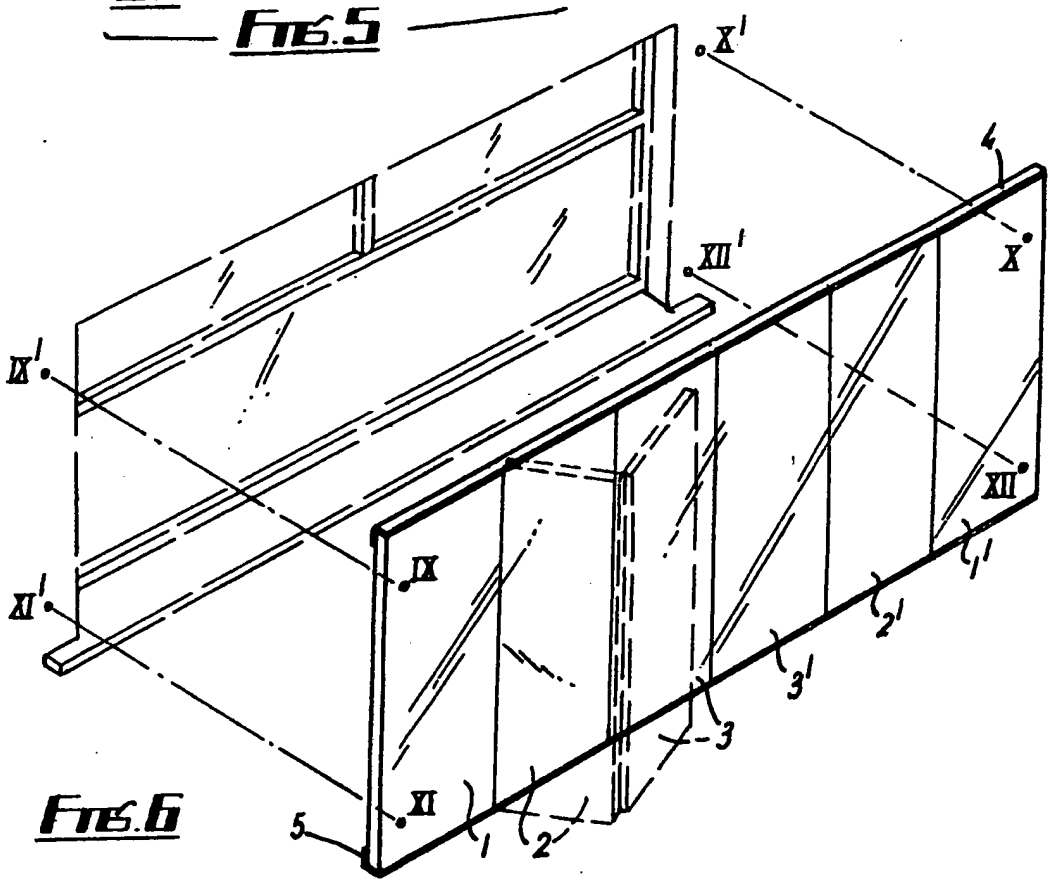


5.1 5.2 5.3

Фиг.5



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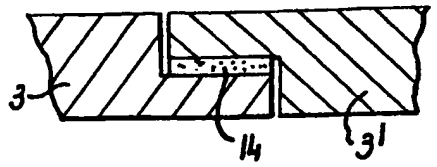

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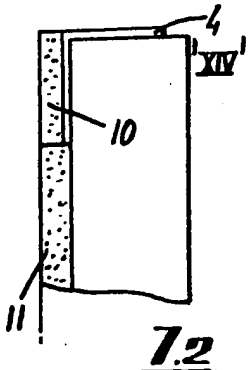

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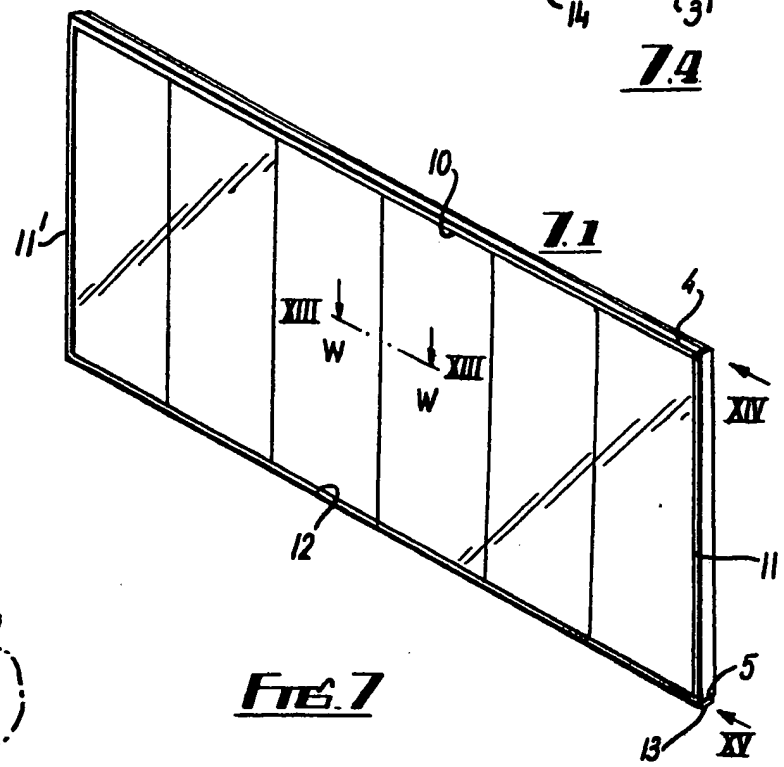
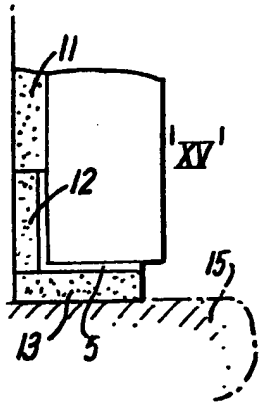


FIG. 7



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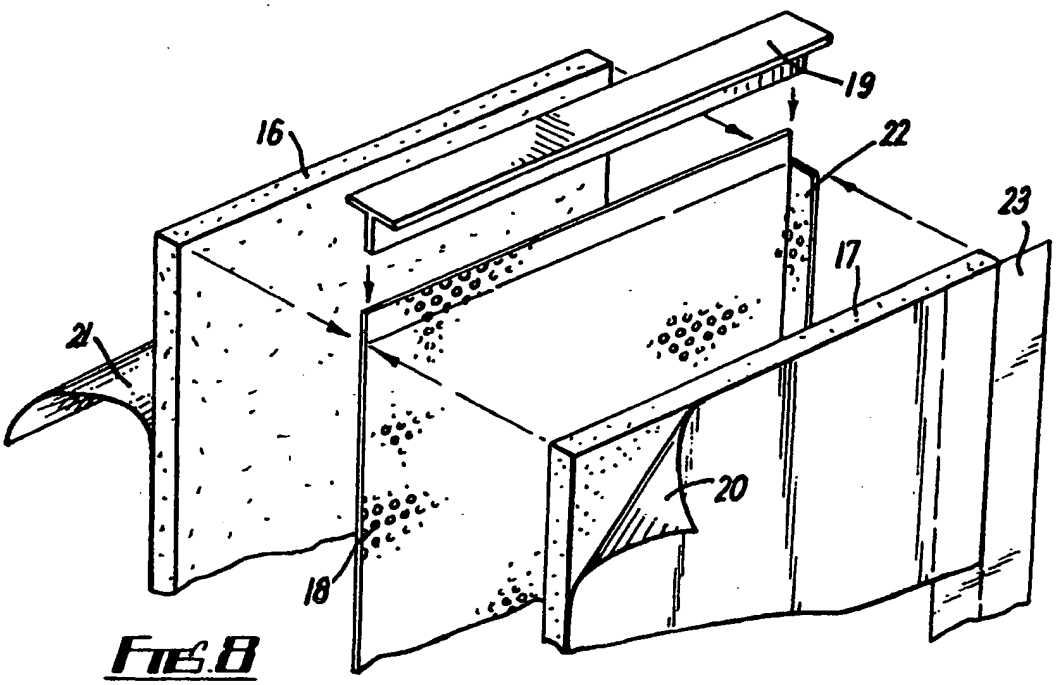
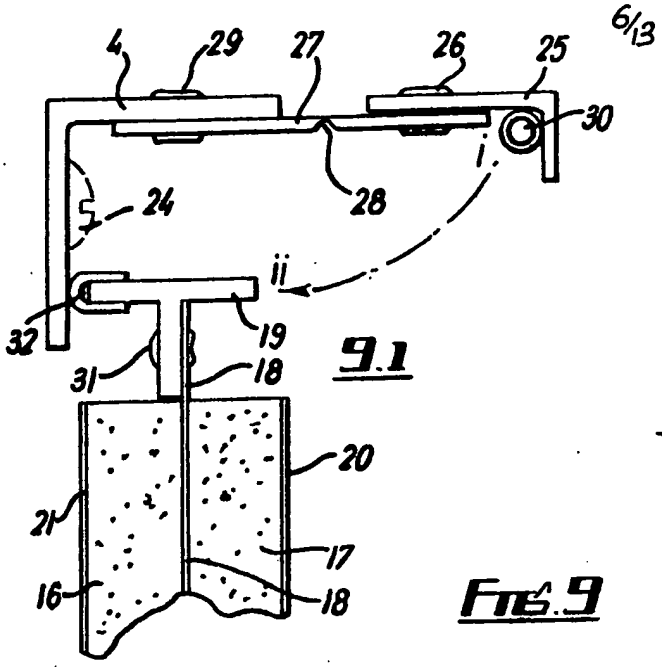


FIG. 8



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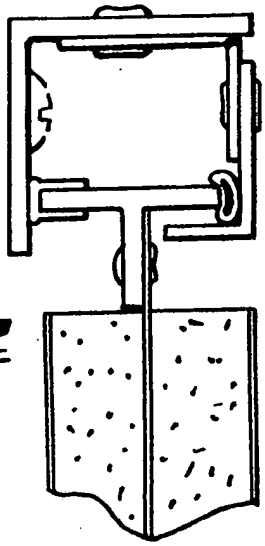

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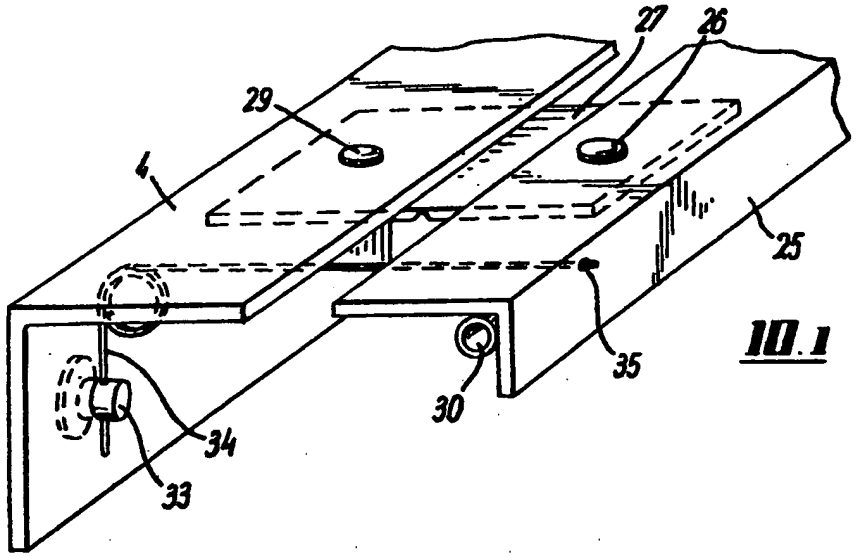

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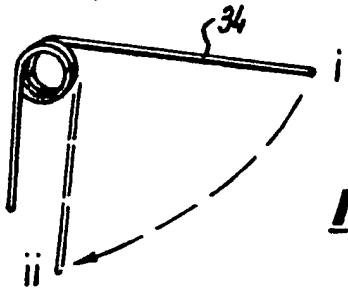

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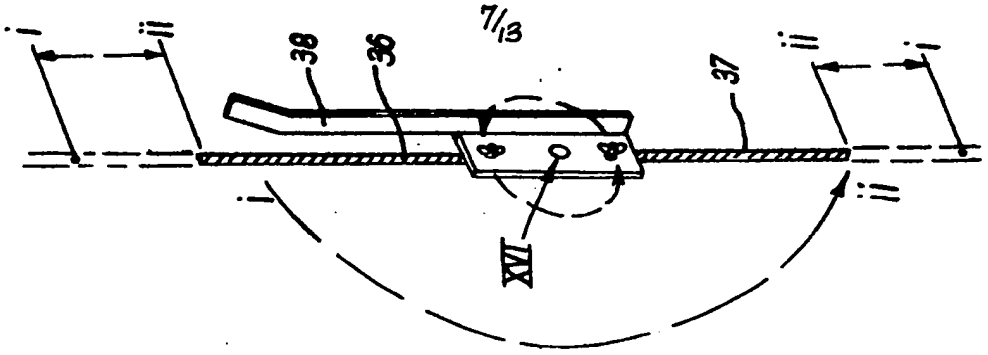
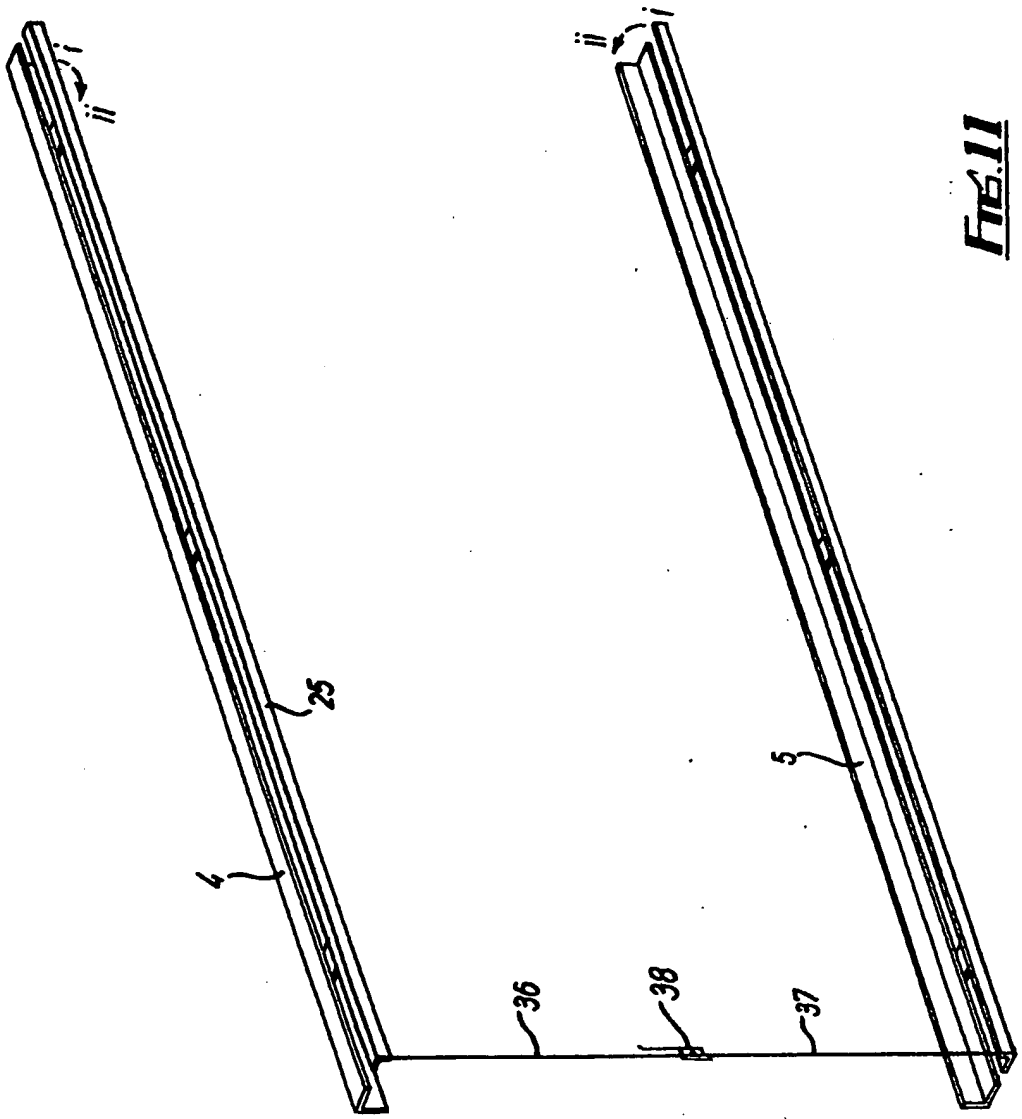
FIG. 10





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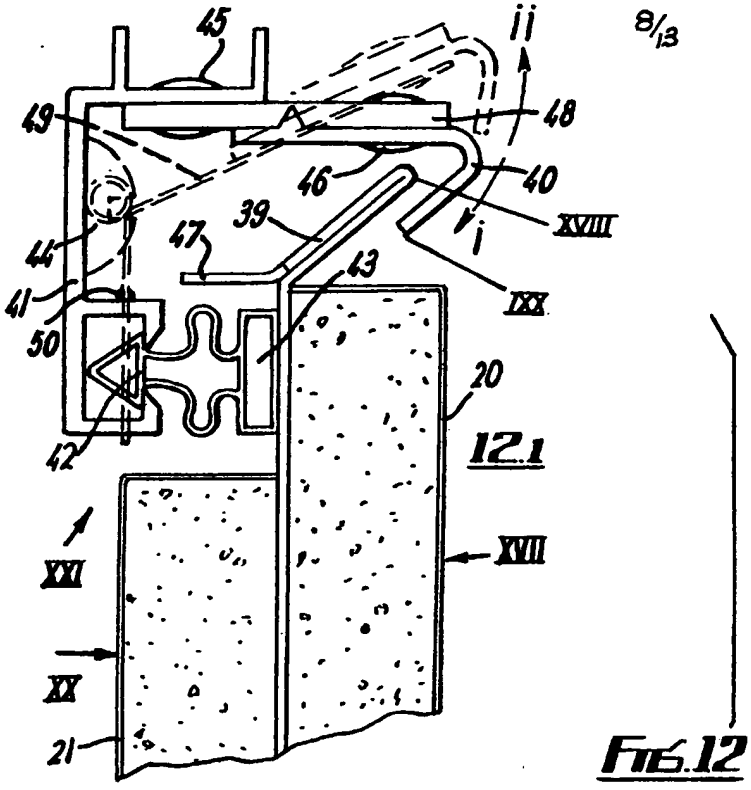

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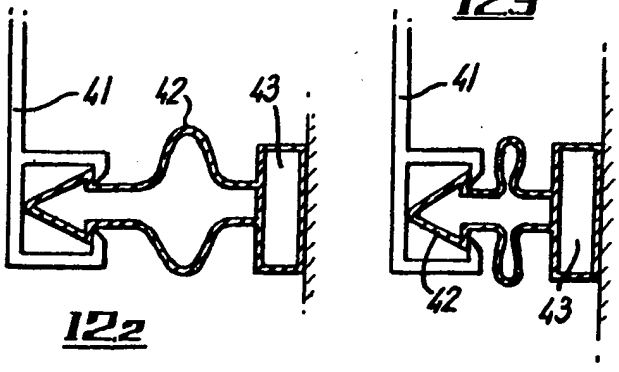

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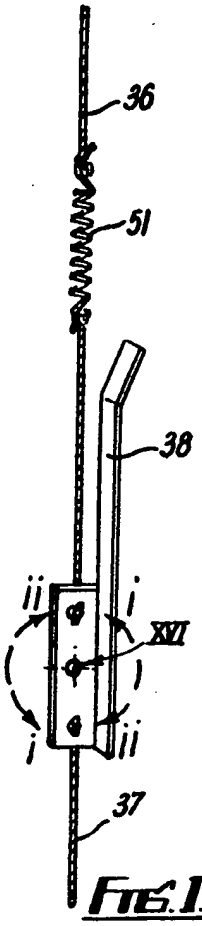

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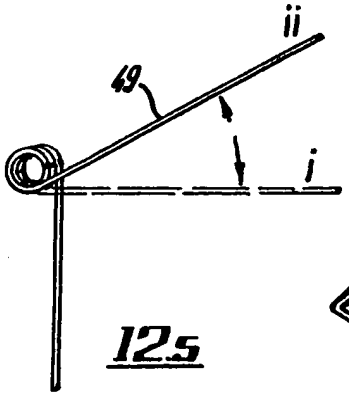

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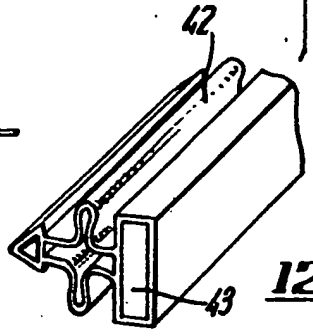

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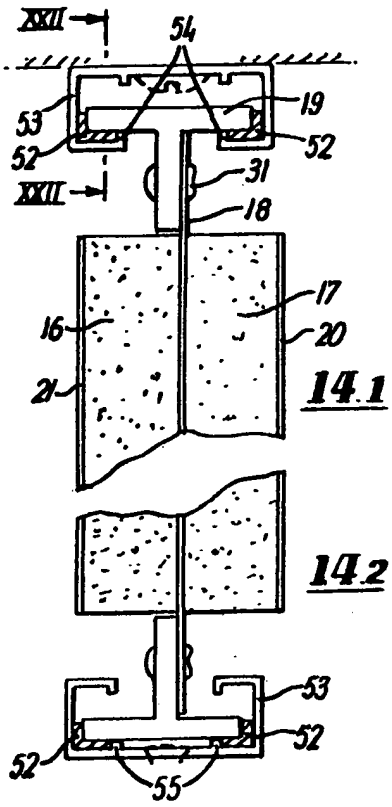
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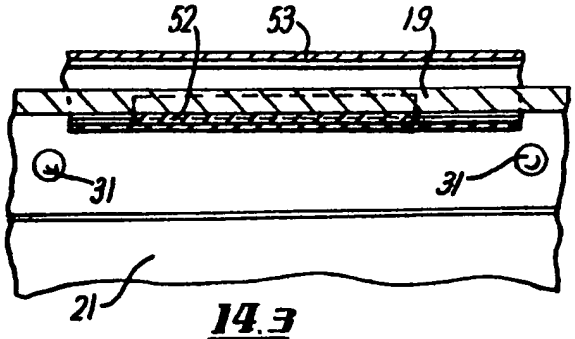
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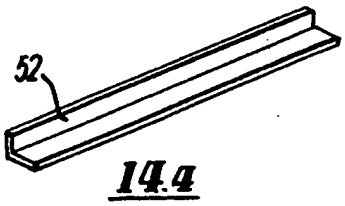
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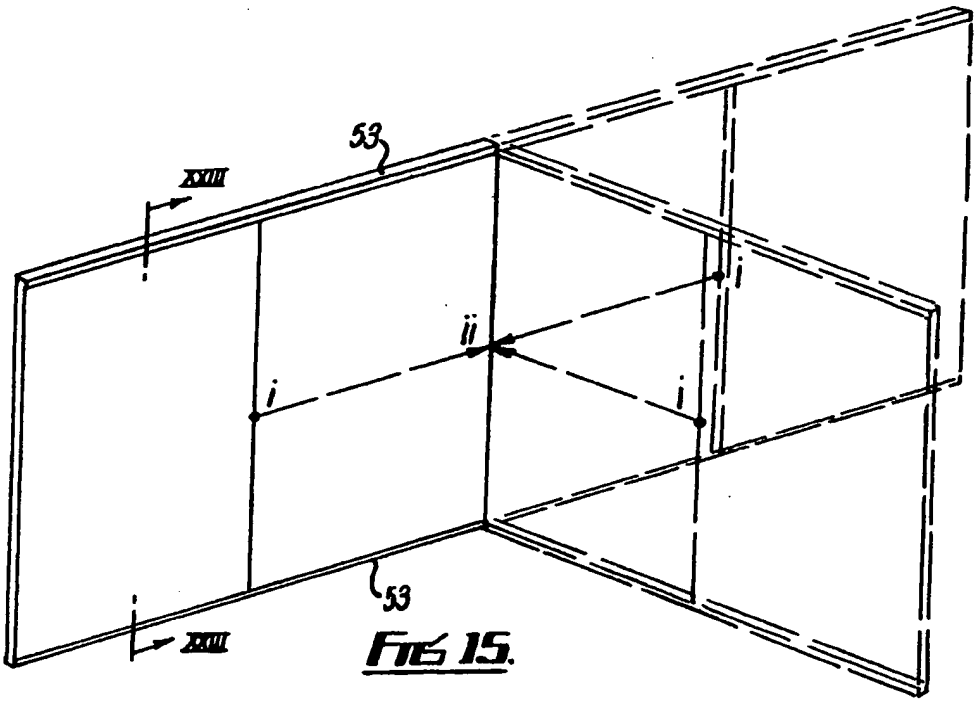
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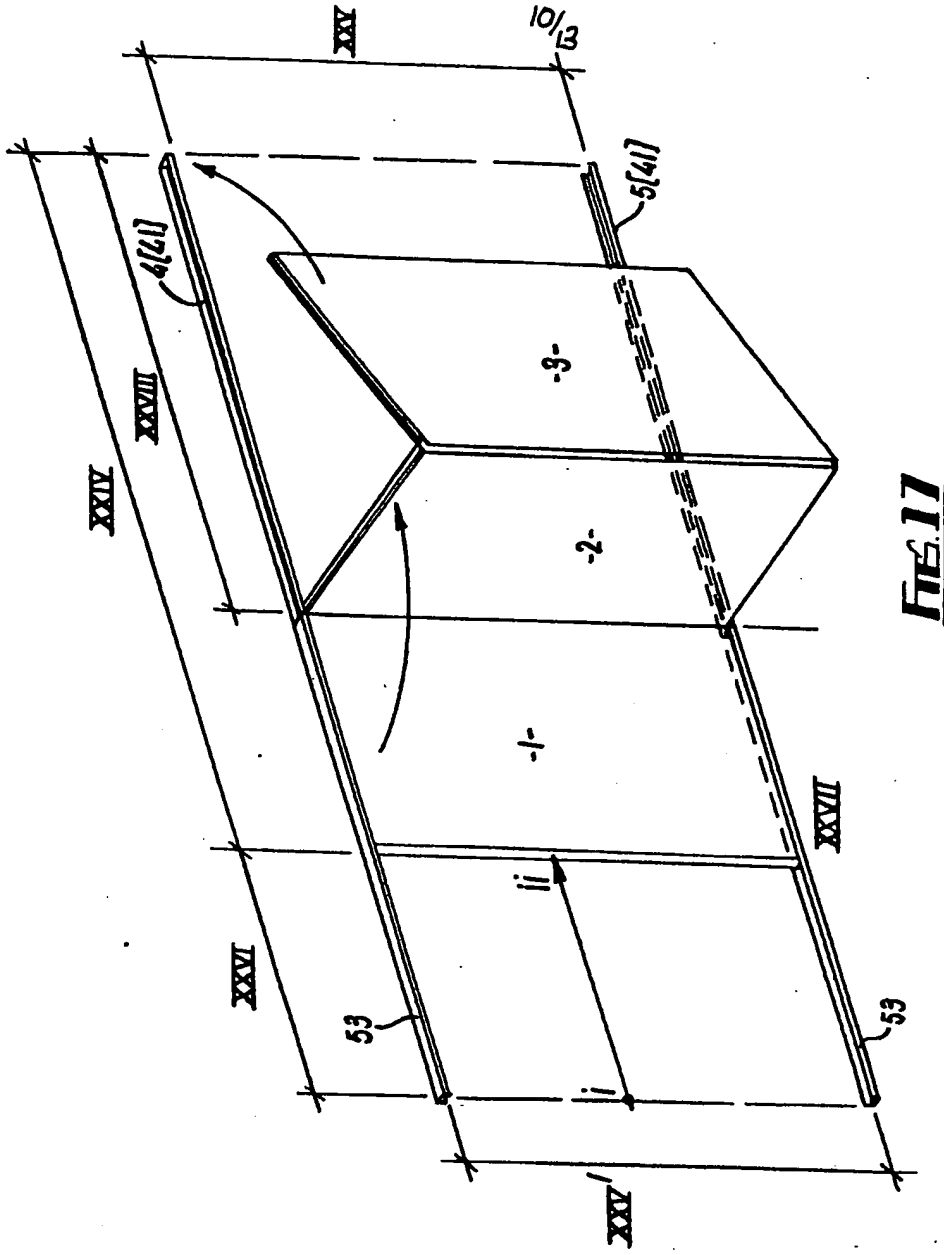
XXIII

FIG 15.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5(41)
4(41)
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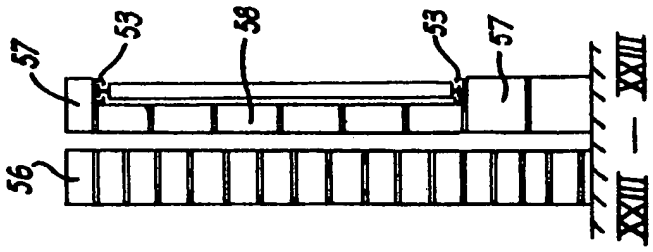
XXV

Фиг.17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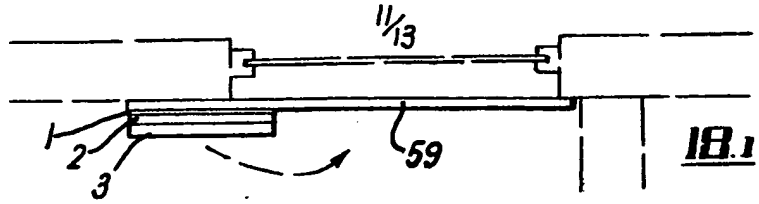

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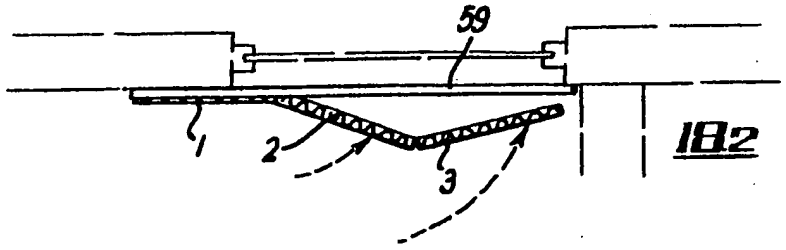

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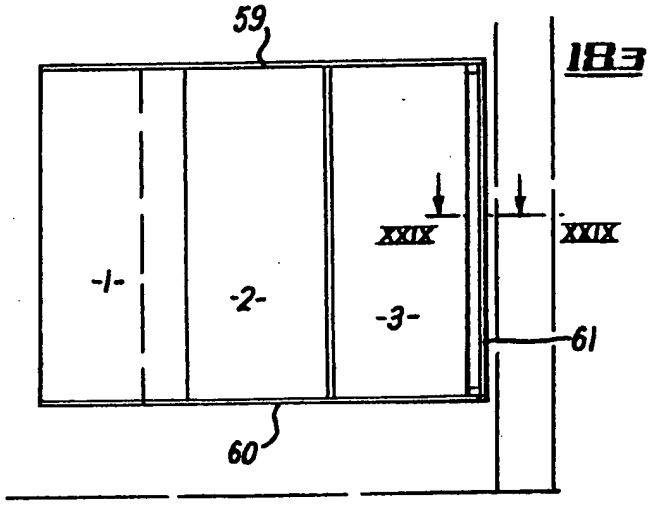

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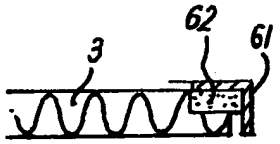
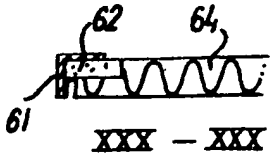


18.4

FIG.18



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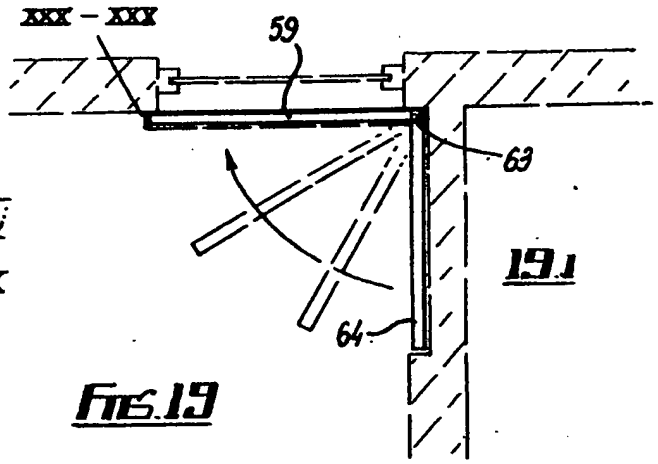
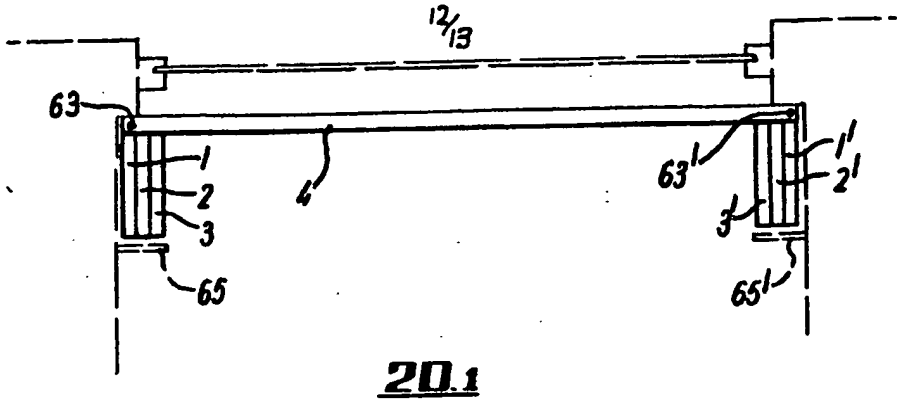


19.1

FIG.19



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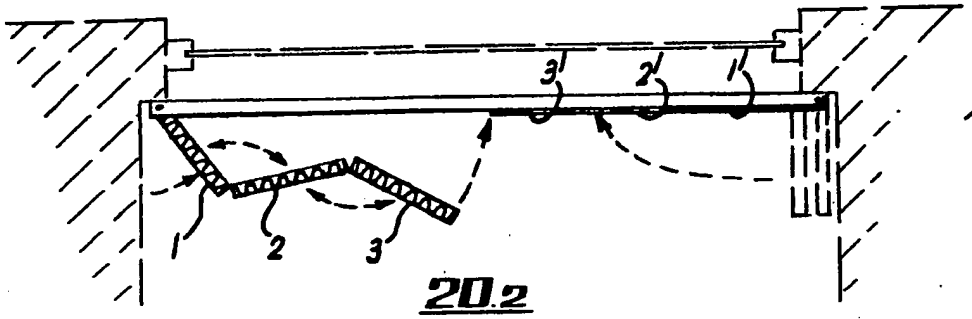
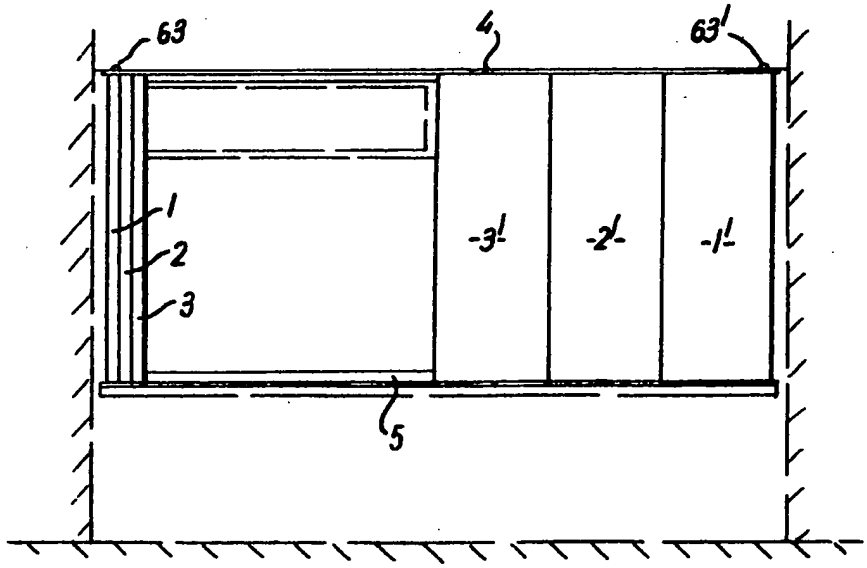
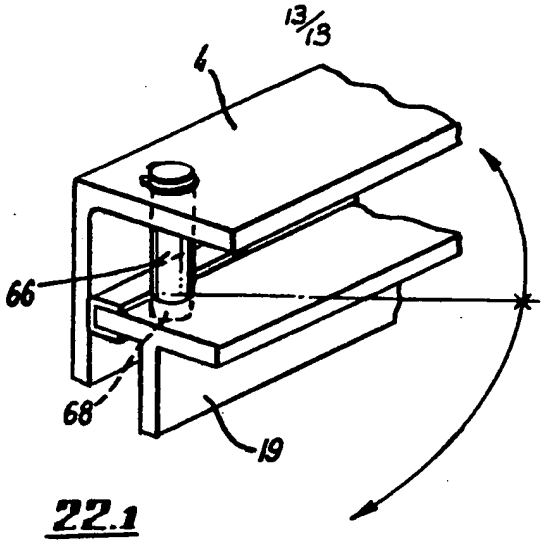


20.2

FIG.21





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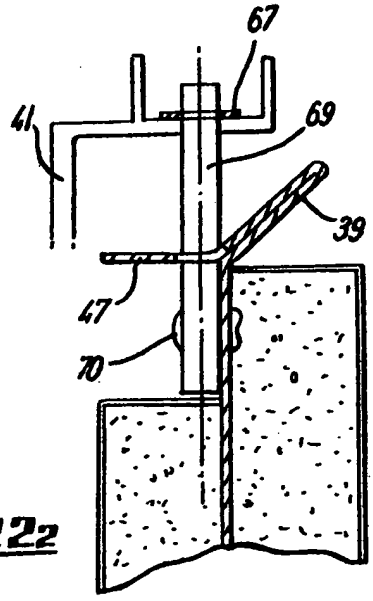

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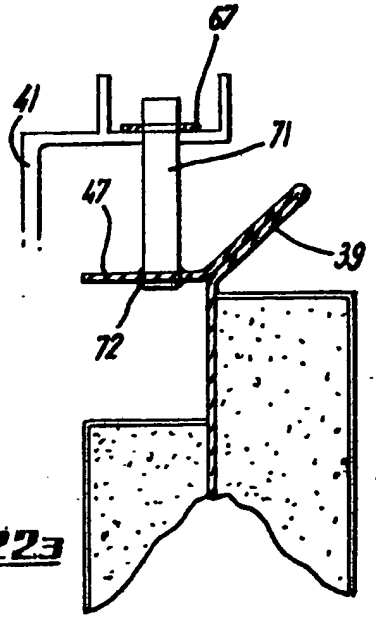

22₃

Фиг 22

SPECIFICATION

Thief-resistant, Insulated Window Shutter

This invention relates to folding window shutters (for all common sizes of windows, including French windows, 'patio-doors' and similar). These shutters are substantially manufactured from panels of a fibrous or cellular insulating material, preferably within a supporting framework, which serve to reduce the outflow of heat from the windows to atmosphere.

It relates to the manner in which a given size of shutter of the current invention may serve a variery of windows of differing dimensions of height and width, and the manner in which the shutter may be substantially erected prior to fitment at the window, thus enabling such fitment to be carried out by unskilled individuals, without training or special tools, in a quick and easy manner.

It also relates to the manner in which the shutter is reinforced and the system of securely locking and sealing the shutter, in its closed state, to the window surround so as to provide a substantial degree of thief-resistance and heat retention by significantly reducing draughts and convection currents.

If further relates to the manner in which the shutters, in both their "open" and "closed" state, may simulate conventional window drapes (curtains), thus gaining aesthetic acceptance and saving the user the cost of such drapes and associated "window-furniture" (curtain rails).

It also relates to the manner in which the make-up of the shutter may be extended to give alternative methods of closure with, for example, a single one-piece panel sliding across a window or, alternatively, a combination of sliding and folding panels. In all cases, the essential advantages of heat retention and thief-resistance are maintained.

It also relates to the manner in which the make-up of the shutter may be further extended to give a single (rather than a pair) shutter either of one piece or multi-panel folding construction, which could be fitted at one side only to the window—applicable where it was desired to leave a side clear or where there were physical limitations making the fitment of a pair of shutters impracticable.

It also relates to the manner in which the make-up of the shutter may be extended so that a single panel, multipanel, single-shutter or pairs of shutter may be fixed to a wall at right angles to a given window and from there, hinge or fold onto the window. This application would be appropriate for corner window or, for example, for fitment to windows occupying the width of a narrow hall.

It is known to provide window-shutters fitted either within a building, or externally, for the purposes of providing security against a thief or limiting the heat loss from the building. Such shutters may pose problems, both from a manufacturing aspect and for the user. For example, an external shutter is inconvenient in use, particularly above ground level; it is difficult to lock, and requires extra maintenance because of its exposure to the elements. An internal security, or heat-saving shutter, fitted within the window reveal, must be accurately manufactured—particularly the height dimension—so as to fit closely within the window reveal, and may reduce the effective width of the window, so limiting the light entering the window, when folded open.

Such a shutter may also be resisted on aesthetic grounds as the construction commonly requires a number of narrow, vertically-hinged or louvred panels which are visible and detract from the appearance of the window. A further deficiency is that the construction of such shutters, whilst providing a thermal barrier in the shutter material itself, is difficult to fit to the window in such a way as to ensure a reasonably draught-proof seal, thus losing the enhanced insulating effect of a static bank of air between shutter and glass and giving rise to draught and convection currents resulting in heat losses.

It is also known to provide panels overlapping, or sliding across a window. These pose problems of inconvenience and, particularly, aesthetic appeal and because of this have gained little acceptance so far in domestic or office applications.

Moreover, as all these shutters are typically manufactured with one primary objective—to resist the thief OR to retain heat—any resultant heat-saving by a thief-resistant shutter, or thief resistance by a heat-saving shutter is incidental to its primary function. Additionally, such shutters may need to be made exactly to the size or shape of the window, presenting economy-of-scale problems to the manufacturer, and may need to be fitted on-site by skilled workmen, thus substantially increasing the cost to the purchaser.

By comparison, the shutters of the present invention are always fitted internally, so that they are convenient to use and require little maintenance. Although they can be fitted within a window reveal, they are preferably fitted to the inner wall around, and overlapping, the window profile. The degree of overlap, either on height or width, is immaterial to the function of the shutter so that a given size of shutter will suit a variety of window sizes, thus providing a basis for economic manufacture (i.e. 'standard' sizes increasing in 'steps').

A particular feature of the invention is the make-up of the shutter whereby, irrespective of window width, the shutters, preferably, comprise two sets of 3 panels, hinged vertically, which can be folded to the right and left of the window respectively. Thus, the folded shutter width is always a constant proportion of any given window width—approximately one-sixth. This is a similar proportion to conventional window drapes which the shutters replace so that, as the shutter is preferably lined on its outer face with a decorative, or fabric, finish, the shutters will have

an appearance not unlike conventional window drapes both folded open and closed, thus promoting their aesthetic acceptance. The user is moreover saved the expense of separately providing drapes and curtain rails.

Most importantly, the invention combines the equal advantages of insulation and thief-resistance. Closed, it provides an efficient insulation barrier which—for example—may be over twice as effective as that provided by double glazing and the manner of closure incorporates a sealing and locking mechanism which ensures an effective seal around the periphery of the window. This reduces the heat loss through draughts and convection currents and further enhances the total insulating effect by creating a static bank of air between the shutter and the glass which acts as additional insulant.

The shutter of the present invention permits factory pre-assembly within a self-contained frame, prior to fitting at the window, together with simple in-built seals and a manner of fixing which enables the shutters to be presented to the window and readily secured, without need of special skills and using only simple domestic hand tools.

The shutter here described provides a considerable level of thief-resistance by the incorporation of a metal barrier within the insulating medium which is capable of being securely locked into the frame surrounding the window profile. This manner of lock is such that any pressure from outside—such as a thief might apply in attempting to gain entry—serves to increase the locking action of the shutter. Conversely, the same locking action permits ready and convenient opening of the shutter from within the building when it is desired to re-open the shutter.

According to the invention, two sets of (preferably 3) panels, manufactured substantially from stiff or flexible, insulating material, are mounted within a surrounding framework. The extreme left hand and right hand vertical members of this framework may actually be comprised of one each of these panels at the left hand side and right hand side respectively and these panels, being fixed at either side of the window, do not move in use. The remaining (two) panels of each set are vertically hinged to one another, and to the fixed panels, concertina-fashion. In the open ('daytime') state, the hinging permits the shutters to be folded back flat and compactly upon themselves. Upon closure, the two movable hinged panels on either side are unfolded and moved inwards to meet one another and seal down an imaginary vertical line mid-way along the window.

Around the periphery of the shutter, on the 'wall' side, and along its bottom, is fixed a compressible rubber or plastic gasket. When the shutter is fixed to the wall, or its base rested upon a projecting window-ledge, this gasket is compressed providing a continuous air seal around the shutter, thus ensuring that air movement between the shutter/framework and wall is minimised. Similarly, the moving panels of the shutter meet a separate gasket along the line where they rest, in their closed state, against the surrounding framework, thus ensuring that air movement between the shutter components themselves is minimised. The combined effect of these gaskets minimises air flow and convection currents between opposite sides of the shutter.

The manner of fixing the shutter, once assembled, to the window surround is very easy. The user simply determines the approximate centre of the window and positions the centre of the pre-mounted, framed shutter to this point. Fixing holes are provided which the user may spot through with a pencil point. After so marking, the shutter is removed and these points are drilled and plugged, the shutter re-presented and screwed into position

The panels are hinged one to another with fabric strips, or reinforced plastic tapes, bonded to either side of the joint between two adjacent panels. These strips also serve to ensure a draught-proof barrier along the line of the joint.

The whole inner and outer panel faces may be over-laid with a decorative material, for example, vinyl-textured, or plain wallpaper, or—preferably—a fabric which then both in the closed and open state will provide a very close visual substitute for curtains.

Each insulation panel comprises a lamination of one or two thicknesses of an insulation material such as fibrous insulation board or an expanded plastic such as polystyrene or polyurethane, bonded to, or on each side of, a thin sheet of metal. This metal sheet may be plain, perforated or expanded and provides both structural support for the panel and, being relatively difficult to cut, imparts a high degree of thief-resistance to it.

Each metal sheet of each panel is fixed securely at both its top and bottom horizontal edge to metal locking sections which are the exact width of the panels. These sections may be of folded strip form but are preferably extruded. When the shutters are closed, (night-time) these sections are opened out and aligned along their axis to comprise apparently two continuous strips at the upper and lower horizontal edges of the panels, broken only at the points where the panels hinge.

The profile of these sections is such that in their closed ('night-time') state they are capable of being interlocked to the upper and lower horizontal framework members running along the top and bottom of the window. The members themselves comprise two parallel rails, jointed such that there is a limited degree of rotation of one axis about the other. One member is permanently fixed to the wall and the limited movement of the other enables it to entrap the metal locking sections (previously outlined) when the shutter is closed. Moreover, the style of the interlock preferably results in a light wedging action which is readily disengaged by a slight

counter-rotation of the rail members when it is desired to re-open the shutters. However, pressure applied to the outer (window) face of the panels—such as an intruder might apply—is transmitted via the metal sheet to the locking sections drawings them further within the horizontal rails and increasing the locking or wedging effect of the shutters to the framework.

For certain applications—particularly commercial ones—an alternative, simpler construction may be preferred whereby the shutter, although comprised of substantially the same materials and make-up, can be constructed of ngle panel or a pair of panels which may slide across the window. This style would be particularly appropriate for incorporation when designing new buildings as due allowance could be made for the shutter in its open 'day-time' position and, for added aesthetic acceptance, the shutter could be mounted within rebates either at one side (single panel) or both sides (two panels) of the window of equivalent size and depth to the panel(s) so that the face of the panel would be flush with the general wall with no projections into the room.

Alternatively, certain applications (for example large windows, 'patio doors', or similar) may be best served by a combination of a sliding panel (or a pair of sliding panels) to which is hinged one or more folding panels. Such a make-up could stand clear, or partially clear, of a window in the open ('day-time') position and would not occupy the same space as a single panel (or pair of panels). Closure would be effected by sliding the folded shutters part way across the window and then unfolding the panels generally as outlined previously.

By way of example, the invention will now be described with reference to the accompanying drawings of which:—

Fig. 1 shows a pair of shutters mounted in their frame at 1.1 with an enlarged view at 1.2, 1.3 looking along arrow I.

Fig. 2.1, 2.2 and 2.3 shows the shutter folded open, partially closed, and fully closed respectively.

Fig. 3—3.1, 3.2 and 3.3 are horizontal sectional views through a window indicating various alternative shuttering arrangements.

Fig. 4 shows a single closed set of shutters with a variety of possible window sizes and shapes indicated in chain and dotted outline to show the versatility of the invention.

Fig. 5—5.1, 5.2 and 5.3 are three sectional views through a 'Right hand' set of folded shutter to indicate how the invention lends itself to economic manufacture.

Fig. 6 shows a shutter assembly being presented to a window prior to installation to indicate the simplicity of installation.

Fig. 7—7.1 shows the reverse (wall) side of the shutter; 7.2 and 7.3 are views along arrows XIV and XV respectively and 7.4 a sectional view along XIII—XIII. These views show how the shutter is sealed against the wall and indicate the seal where the two sets of panels meet.

Fig. 8 is an 'exploded' view of the essential components of a typical shutter panel.

Fig. 9 is a sectional view through the top rail of the shutter and a partial section of the shutter showing at 9.1 and 9.2 respectively how the rails can retain the shutter panels in the closed position.

Fig. 10 is a pictorial view of the sectional rail detail of Fig. 9 clarifying how a sprung hinged rail might operate.

Fig. 11 gives an overall view of the top and bottom locking rails (with the panels removed for clarity) showing how the closure/locking action might be operated by a rotating lever.

Fig. 12.1 is an example of an alternative form of sealing and locking mechanism utilising a more complex extrusion for the top and bottom rails and a magnetic strip within an extruded bellows for sealing. 12.2 and 12.3 show the magnetic strip and bellows in further detail.

Fig. 13 illustrates the manner of locking the system indicated in Fig. 12, this being substantially similar to the rotating lever shown in Fig. 11 but with the incorporation of a light expansion spring, necessary with this style of locking.

Fig. 14 illustrates an alternative form of closure utilising the same panel construction but with a sliding closure rather than folding. 14.1 and 14.2 are sectional views through the top and bottom of the rails respectively. 14.3 is a sectional view through XXII—XXII and 14.4 is a pictorial view of a plastic angle rubbing strip.

Fig. 15 shows how such a panel could be fixed at the side of the window and slid across when required. The ghosted view indicates that a pair of sliding panels could similarly be fixed either in line or at right angles for a corner application.

Fig. 16 illustrates how a sliding panel may be mounted within the rebate of a standard cavity wall construction.

Fig. 17 is a view of a shutter utilising both the sliding and folding features.

Fig. 18 shows a variation: single shutter assembly (rather than a pair); 18.1 and 18.2 being plan views, 18.3 a front elevation, with 18.4—sectional.

Fig. 19.1 shows a further variation: a single shutter of a one piece (rather than hinged-panel) construction mounted on a wall at right angles to the window.

Fig. 19.2 shows a section taken at XXX—XXX a point mid-way down the LH vertical frame to the LHS of the window.

Figs. 20.1 and 20.2 show plan views of another variation on the construction: shutters mounted at right angles to the window.

Fig. 21 is an elevation of the shutter outlined in Fig. 20.

Fig. 22—22.1, 22.2, 22.3 show three suggested forms of pivoting the shutter.

Fig. 1.1 shows a plan, front and end elevation of the basic shutter assembly. Two sets of panels, 1, 2, 3 and 1′, 2′, 3′ are hinged concertina-

fashion to one another and panels 1 and 1′ are fixed at their top and bottom edges to two horizontal angle rails 4 and 5 (the 'upper' and 'lower' "frame longitudinals").

Fig. 1.2 is an enlarged view, for clarity, looking in the direction of arrow I, showing the fixing screws 6 & 7 securing panel 1 in position.

Fig. 1.3, again looking in the direction of arrow Z, shows the 3 panels part unfolded. 8 and 9 indicate hinge points provided by fabric or plastic strips bonded to alternate edges of the panels.

Fig. 2.1 shows plan and elevation views of how the shutters would appear in their opened (daytime) state. It will be apparent that the proportions correspond closely with conventional curtains so that, if the faces of panels 1, 2, 3 and 1′, 2′, 3′ are covered with a fabric, a very similar visual effect to curtains will be achieved.

Fig. 2.2 shows the panels being opened up across the window, part way through closure.

Fig. 2.3 shows a plan and elevation view of the shutters fully closed.

Fig. 3—3.1, 3.2 and 3.3 shows a plan view of a given window of constant size, with a variation of shutter size to indicate the flexibility of the system. At 3.1 the shutter is mounted so that its width corresponds approximately to the width of the window itself. This arrangement is particularly appropriate to applications where space at either side of the window is limited or where, for example, the window comes very close to a corner wall as indicated in Fig. 3a by the dotted lines 'II—II'.

Fig. 3.2 indicates, on the same window, a larger shutter providing a partial overlap.

Fig. 3.3, with the same window, shows a shutter assembly of even larger size mounted clear of the window to provide maximum light.

Fig. 4 shows another aspect of the flexibility of the shutter construction whereby a given size of shutter (shown here closed) may suit a variety of window sizes and shapes as indicated by the dotted outlines III, IV and V. This indicates how a limited standard range of shutters might serve a wide range of window sizes thus giving opportunity for economic manufacture ('standard sizes').

Fig. 5 illustrates sectional views through a given set of (Right-hand) shutters showing how the principle outlined in fig. 4 might be further refined to enable the construction of the shutter to be based upon a minimum range of standard panel sizes. It will be seen from fig. 5—5.1, 5.2 and 5.3 that, to achieve a given closed width, it is only necessary to alter one panel width so that the standard panel size VI in 5.1 can be taken for two of the panels in 5.2 and 5.3 with narrower panels VII or VIII giving the exact overall size required when the shutter is opened.

Fig. 6 outlines the relative ease of installation of the shutter to a given window. The method of construction permits pre-assembly—at a factory for example—so that a user might receive it as indicated in the pictorial view. Four holes IX, X, XI, XII could be provided which the user, after aligning the shutter against the window, could spot through to give the points IX′, X′, XI′, XII′ respectively on the wall. These points could then be drilled and plugged and the shutter represented and screwed securely to the wall. This straightforward method of installation could readily be accomplished by an average unskilled individual without need of special tools or training.

Fig. 7.1 shows the reverse (wall) side of a closed set of shutters. Looking along arrows XIV and XV respectively gives the (enlarged) views outlined in fig. 7.2 and 7.3. Flexible expanded rubber or plastic sealing strips 10, 11, 12 and 13 are bonded to the entire profile of the shutter and along the bottom of the lower frame longitudinal 5 so that when the base of the shutter is rested upon a projecting window ledge 15, fig. 7.3 and the shutter assembly screwed firmly to the wall, as previously outlined, a good standard of draught-proof seal would be achieved thus minimising draughts and convection currents.

Section XIII—XIII at 7.4 indicates a similar sealing strip between the abutment of panels 3 and 3′ upon closure.

In Fig. 8, a more detailed typical panel construction is outlined in exploded form. Two sheets of fibrous or cellular insulating material 16 & 17—for example wood-fibre, flexible expanded plastic or (preferably) rigid polystyrene or polyurethane are bonded to either face of an expanded or perforated sheet metal such as steel or aluminium, 18. This metal sheet might have its edge(s) formed as indicated by the leg 22 to impart structural stiffness to the panel. The metal sheet projects beyond the top and bottom ends of the insulating sheets and both ends are securely fixed by, for example, riveting to locking sections 19, T-shaped sections of formed strip metal or—preferably—extruded aluminium.

The inner and outer surfaces of the panels can be finished in a suitable material 20 & 21, for example, wallpaper or vinyl, or they may be painted or veneered, though preferably they are finished in a fabric so as to serve as a visual substitute for window curtains and gain aesthetic acceptance.

N.B. It should be noted that the upper and lower edges of the panels are of identical construction thus Fig. 8, if inverted, would indicate an exploded view of the bottom edge of a panel.

A strip of fabric or plastic 23 runs immediately under the decorative material, and is bonded to it, and this is similarly bonded to the adjacent panel to provide a flexible hinge between the two panels which will also exclude draughts between the joints.

Fig. 9 shows a typical section through the top edge of a shutter (this, again, inverted would show a view of the bottom edge).

A more detailed view of the upper frame longitudinal is given showing it to be comprised of two angle sections, the basic angle 4 which may be fixed to the wall by the screw 24 and a smaller

locking angle 25 of strip or extruded metal connected to the basic angle by straps 27 riveted to the two angles at 26 and 29. These straps may be made of plastic such as polypropylene so that an indent would produce a hinge at 28 about which the smaller locking angle can partially rotate as indicated.

As previously outlined, 19 is the T locking section riveted at 31 to the metal sheet 18. A light rubber channel gasket 32 can be bonded to the inner horizontal leg of the T locking section.

Fig. 9.1 shows the shutter assembly at a point when the shutter panels have been closed (night-time) but not locked.

Fig. 9.2 shows them locked. It will be seen that the smaller locking angle 25 has rotated through 90° overlapping the outer leg of the T locking section 19, thus the two sections are interlocked and gaskets 32 and 30 are compressed so as to provide a double seal.

Fig. 10.1 is a pictorial view of a section of the frame longitudinal showing the strap 27. To maintain the small locking angle 25 in its normal 'open' position, springs 34 are fitted at each end of the longitudinals mounted in drilled studs 33 and projecting through holes 35 in the small locking angle 25.

Fig. 10.2 shows the spring in its natural, unstrained state with the legs 90° opposed. In locking, spring tension must be overcome in moving the horizontal leg from i to ii.

Fig. 11 illustrates generally the construction of a system for operating the locking action outlined in Figs. 9 and 10. The upper and lower frame longitudinals 4 and 5 (shown with the shutter panels removed for clarity) are connected by cords 36 and 37 about a rotating lever 38. When the lever is moved about pivot XVI through 180° from i to ii, the cords are effectively 'shortened' and the locking angles pulled down against the tension of the spring 34, thus locking the T sections in situ. Counter rotating the lever reverses the operation unlocking the sections.

Fig. 12 illustrates an alternative form of suggested sealing and locking mechanism. The insulation panel construction is substantially as outlined previously though the T locking section is dispensed with and the metal sheet is extended top and bottom, doubled back upon itself for strength and cranked at an angle as shown, 39, Fig. 12.1.

The upper (and lower) frame longitudinals comprise aluminium extrusions 41 to which is riveted (45) hinged, plastic straps 48 similar to those outlined in Figs. 9 and 10. The small locking angle 40 is riveted at 46 to these.

An extruded plastic gasket (of a type commonly found in refrigerator doors) 42 can be plugged along its length to the channel within the longitudinal frame members. Within this extrusion is housed a magnetic strip 43. When the shutters are in the closed position, the magnet is attracted to the metal sheet and a draught-proof seal effected.

The locking angle 40 is fixed on its underside to the upper leg of spring 49. Note from Fig. 12.5 that the unstrained position of this spring is position ii 45°: upwards to the horizontal. The lower vertical leg is inserted in holes within the channel section of the longitudinal extrusion 41, a dimple at 50 positioning it there.

Fig. 13 indicates a lever 38 which operates in accordance with the system in Fig. 11. The locking angles 40 in Fig. 12.1 are drawn down against the tension of spring 49 into position i when the lever is rotated. Note that cord 36 is broken by an expansion spring 51, the tension of which is greater, and can therefore overcome the tension of spring 49 when the cords are 'shortened'.

Prior to closure of the shutter (with the panels in their folded-back, 'day-time' position) the lever is rotated so that tension is applied and the upper and lower locking angles 40 are drawn towards one another (position i). The shutter panels are then unfolded and brought towards the centre of the window (as outlined in Fig. 2). As the LH face of the cranked angle 39 meets the RH face of locking angle 40, moderate pressure on the face of the shutter—indicated by arrow XVII—will cause the locking angle to be pushed upwards to position ii by the wedging action between 39 and 40, and, in so doing, overcome the tension of spring 51. When the shutter is fully closed, point XVIII on 39 having passed point IXX on 40, the locking angle will snap back into position i under the tension of spring 51, and simultaneously the magnetic seal 43 will establish itself.

N.B. For clarity, Fig. 12 also shows the extruded bellows gasket 42 housing the magnetic strip 43 in its open state 12.2 closed state, 12.3 and an explanatory part pictorial view, 12.4.

Once closed, it will be clear that pressure applied on the window side of the shutter—as indicated by arrow XX in Fig. 12.1—will move the cranked leg 39 directly into locking angle 40 and wedging it securely there. Further pressure will only increase this wedging effect, providing a good measure of thief-resistance. For additional security, the crank at 39 could, if required, be extended by the horizontal leg indicated at 47. This would resist the insertion of—say—a metal strip which a potential thief might insert in the general direction of arrow XXI, in attempting to force entry.

When it is desired to re-open the shutters, lever 38 is rotated back through 180° from i to ii, effecting 'lengthening' cords 36 and 37 and eliminating the tension within the expansion spring 51. The slack within the cords will then allow the springs 49 top and bottom to hinge the locking angles 40, upwards and downwards respectively, clear of the cranked leg 39. The shutters can then be folded back into their 'open' position.

Figs. 14 and 15 indicate how the shutter construction can readily be adapted for applications where it is desired to shutter the window with a single unbroken sliding panel or (ghosted outline in Fig. 15) a pair of sliding

panels—for larger window areas or corner windows at right angles to one another.

Exactly the same panel construction outlined in Fig. 9 is used but the T section 19, top and bottom, being housed within extruded channels 53 running the full length of the window and extending beyond it to—say—the approximate width of the panel(s).

Plastic rubbing strips 52 are located within lugs 54 (top) and 55 (bottom) of channel 53 to promote a smooth sliding fit in closing the shutter from position i to ii in Fig. 15. Upon closure, a simple lever catch fixed at the end of the shutter would be sufficient to secure it and deter a thief.

For clarity, a section view through XXII—XXII of Fig. 14.1 is given in Fig. 14.3 and a pictorial view of a plastic rubbing strip indicated at 14.4.

Fig. 16 indicates an arrangement for housing the sliding shutter within a rebate in a wall to the side of the window. This application would be most appropriate for specifying in new buildings where due provision could be made during construction. The view is sectional taken through the shutter and wall in the open (daytime) position—for example, along XXIII—XXIII in Fig. 15.

56 is the outer leaf which might be brick, 57 and 58 might be two thicknesses of blockwork. *N.B.* The shallow profile of a typical shutter would enable standard blocks to be used for both the general wall (57) and within the rebated portion (58) whilst conforming with appropriate building regulations.

The shutter is shown, with the lower extruded channel 53 mounted on the bottom of the rebate and the upper extruded channel 53 fixed to the underside of the rebate at the top.

Fig. 17 outlines an arrangement whereby the features of both sliding and hinged panelled shutters could be incorporated into one assembly. This would be particularly appropriate for large window areas. XXIV and XXV respectively indicate the approximate length and height of a given window. Extruded channels 53, of length XXVII, are fixed at the top and bottom edge of the window with half their length to the side of the window, the other half overlapping the window. Along the remainder of the window (top and bottom) and of length XXVIII, the upper and lower frame longitudinals 4 and 5 could be mounted along with the locking system oulined in Fig. 9. Alternatively, the longitudinals and locking system outlined in Fig. 12 could be mounted.

The shutter assembly comprises, for example, 3 panels 1, 2, 3 hinged together as outlined earlier but with panel 1 being capable of sliding along the channel XXVII instead of being fixed and static. In the open, day-time, state, the panels are folded back upon themselves to the side of the window in the area bounded by XXV—XXVI either on the surface of the wall or within a rebate similar to Fig. 16. Upon closure, the three folded panels are slid into position i to ii, covering one third of the window length. Panels 2 and 3 are then unfolded to cover the remaining, along length XXVII being locked into the upper and lower longitudinals 4 and 5 by either of the locking systems outlined in Figs. 4 or 12. To open the shutter, the operation is reversed.

This arrangement may also be 'doubled-up' and, for example, applied to very large window areas (or corner windows at right angles to one another) similar to the previous ghosted arrangement in Fig. 15.

Fig. 18 shows how the basic construction may be further extended to provide a single (rather than a paired) shutter assembly fixed at one side of the window.

Panels 1, 2, 3—comprising the entire shutter panel assembly (there being no complementary pair 1′, 2′, 3′) are hinged together in the conventional manner outlined earlier. Panel 1 is fixed top and bottom to angle horizontal longitudinals 59 and 60. These respectively correspond to the horizontal longitudinals 4 and 5 in Fig. 1 but, for a given panel size 59/60 will be half the length of 4/5.

The cross section of 59 and 60 might correspond with the outline in Figs. 9 and 10 or, alternatively, Fig. 12 and the panels can be hinged and secured in their closed position in exactly the same way as shown in these figures.

Note that this alternative construction requires an additional frame component, vertical angle 61, connecting longitudinal 59 and 60. Panel 3 is fitted with a compressible rubber or plastic gasket 62 which seals against angle 61. A cross sectional view of this seal is shown at 18.4, this being a section through XXIX—XXIX.

The figure shows a 'Left-handed' application. However, it will be clear that the configuration could be reversed and the panels hung to the right of a given window, if so desired.

Fig. 19.1 is a plan view through a window showing how the construction can readily be extended to provide a single panel construction fitted—say—to a wall at right angles, and in close proximity to, the given window. In the figure, single shutter panel 64 rotates about pivot 63. It may, if desired, be housed within a rebate in the wall, as indicated, but this is optional—it could as readily be hung to the face of the wall.

Again this application requires the use of the additional component—vertical angle 61 against which is compressed seal 62 upon closure. In closing, the same longitudinals 59 and 60 are utilised as in Fig. 18 and the same systems of locking the shutter to the longitudinals may be employed (as outlined in Figs. 9/10 or 12).

N.B. Details of a typical pivot are given in Fig. 22.

Fig. 20 shows plan views of a further extension of the shutter construction: 20.1 and 20.2 being respectively views of the same shutter open and part-closed.

1, 2, 3 and 1′, 2′, 3′ hinged shutted panels, are joined together in the conventional manner, but panels 1 and 1′, instead of being fixed, at either side of, and along the same plane as, the window, are pivoted at 63 and 63′ and mounted at right

angle to it (in the shutters open, day-time state).

This application might be preferred where it is desired to admit the maximum light possible through a given window (Fig. 20.1 indicates minimal obstruction at the window) or where there is an obstruction at one, or both sides, of a window. For example, figs. 20 and 21 indicate an application where both sides of a window are bounded by a wall—as might occur for instance in a narrow hall where the window occupied the entire width.

To close, the shutter panels 1, 2, 3 and 1', 2', 3' are hinged inwards about pivots 63 and 63' and opened up to engage, and lock with the conventional longitudinals 4 and 5. The same locking system outlined in figs. 9/10 or, alternatively, 12 might be employed.

If so desired, this style of shutter construction could be totally concealed by fitting narrow, decorative strips—for example, thin, flat sections of hardwood or veneered board—indicated by ghost outline 65, fig. 20.1.

Fig. 22 indicates how the pivoting arrangement—necessary for the shutter applications outlined in figs. 19, 20 and 21—might be incorporated into the standard construction.

Referring to the locking system outlined in figs. 9 and 10, fig. 22.1 shows a short circular rod which is a tight fit at 68 in the T locking section 19. It can rotate smoothly in a clearance hole within the upper longitudinal angle 4. *N.B.* a corresponding pivot is fitted to the bottom locking T section, rotating within the lower horizontal angle 5.

A circlip 67, engaging with a shallow groove in the rod, locates the shutter assembly vertically.

Fig. 22.2 and 22.3 shows a similar pivot fitted to the locking system outlined in Fig. 12. In 22.2, the pivot 69 is passed through a hole in the horizontal extension 47 of cranked angle 39, and is fixed with a rivet 70 to the metal sheet. It rotates smoothly within the horizontal longitudinal 41 (the manner of pivoting is identical top and bottom of the shutter). Location is again provided by circlip 67.

Fig. 22.3 is an alternative to 22.2 utilising a shorter pivot 71 which is stud-welded, or similarly fixed, to the extended leg 47. It operates (top and bottom) exactly as outlined in 22.2.

The shutters of the present invention have the following advantages:—

1. They provide an economic means of retaining heat within a building which would otherwise be lost via the window(s).

2. They can substantially be erected prior to fitting to a given window thereby simplifying the fitting.

3. Both in their open and closed state, they may have the appearance of conventional curtains thus more readily gaining aesthetic acceptance.

4. Notwithstanding point 4, they none the less replace curtains and curtain track thus saving the user the cost of separately providing curtain and track.

5. The shutters incorporate a single and effective sealing system both within the construction itself and between the shutter and wall thereby further simplifying installation and, (by providing a static bank of air) maximising the insulation effect of the shutter.

6. The size of the shutter, relative to the size of the window, is not very important. Thus the user can fit shutters which come completely within, or stand totally clear of, a given window without affecting the function or performance of the shutter. Overlap, either on height or width, is not important so a given minimum range of sizes may suit an extensive range of window sizes and shapes. This, in turn, implies "standard" shutter sizes and economic manufacturing quantities.

7. The multi-panel construction enables a small incremental size change (or a "special" size to the achieved) by modifying just one, rather than all panels.

8. The construction, (besides being substantially pre-erected and pre-sealed) enables the shutter to be fixed in situ quickly and easily by an average unskilled individual without need of special tools or training.

9. Besides the advantages of thermal insulation, the construction may also provide the separate and equal advantages of thief-resistance in providing a shutter which is difficult to cut and one or more systems of ensuring a rigid locking of the shutter assembly around the window.

10. The efficiency of the locking systems may be increased by attempts to interfere with them from the external face. None the less, the shutters may be readily opened by the user on their internal side.

11. The construction of the shutter can be readily extended to provide a single sliding panel either fitted within a rebate or mounted on a wall at the side of a window. Alternatively, the system can provide for two such sliding shutters to be fitted either side of a window and meeting—say—at its centre. Alternatively, the system can provide for a pair of such sliding shutters to be mounted at right angle to one another for a corner application.

12. The construction of the shutter can readily be extended to provide a combination of hinged and sliding panels either singly or in pairs fitted in line or at right angles to one another.

13. The construction of the shutter can readily suit an application suitable for a single assembly of panels fitted to one side only of a given window.

14. The construction of the shutter can readily be extended to suit an application where it is desired to instal a single panel shutter (either within a rebate or surface mounted) to a wall at right angles to a window and pivoting across it.

15. The construction of the shutter can readily be extended to suit an application where it is desired to fit either a single multipanel shutter or a pair of multi panelled shutters to the window

where they may be hung at right angles to the wall and, if desired in their open state, readily concealed. In closing they may readily pivot and open up acros the window.

16. All the alternatives and extensions of the basic construction outlined in 11—15 enable both the prime advantages of thermal insulation and thief resistance to be maintained.

Claims

1. I have outlined a window shutter which offers combined advantages of heat-retention, and thief resistance characterised by design features whereby a metal sheet is incorporated within a laminate of insulating material such that tampering increases the rigidity of fit of the shutter to the window design.

2. The design, whilst offering generally aesthetically pleasing features, provides the specific feature of simulating, and thus economically replacing, conventional window drapes. This is characterised by the 3xunit, decorative folding panel design mounted on one or both sides of the window (in similar manner to curtains.

3. The design provides for standardised, 'modular' manufacture which could cover a wide range of window sizes. This is characterised by the design features which provide for a sizeable overlap on vertical and horizontal dimension with the ability to vary a single panel only within the 3xpanel assembly to achieve incremental sizes. It is further characterised by the overall design features whereby the total shutter assembly can be mounted within or outside the window reveals.

4. The design enables an unskilled user to fix the shutter in an easy manner, this being characterised by design features which provide for substantial factory pre-assembly, supply of shutter within a composite frame and facilities for both sealing and fixing the shutter to the window surround without need of specialist tools or skill.

5. The features of the design can be severally applied to different methods of closure characterised—by way of example—by a sliding panel of similar laminate construction which can be locked within parallel tracks, or single and multi panels hinged at right angles or otherwise adjacent to the window.

New Claims or Amendments to Claims filed on 12 November 81
Superseded Claims 1—5

New or Amended Claims 1—14:—

1. Shutter apparatus for fitting to the internal surface of a wall at or adjacent to a window or other glazed opening, said apparatus comprising at least one non-glazed panel movable from an open position in which the opening is substantially unobstructed, to a closed position where the opening is covered by the panel or panels, a substantial proportion of the or each panel being made from a material having heat insulating properties and sealing means operable to provide a draught-proof seal between the or each panel and the wall surface when the or each panel is in the closed position, the or each panel also incorporating a layer of penetration-resistant material.

2. Apparatus as claimed in claim 1, in which the or each panel comprises a laminate of insulating material and penetration-resistant material bordered by a rigid frame.

3. Apparatus as claimed in claim 1 or 2, in which the or each panel is mounted for sliding movement in a plane parallel to said internal surface of the wall.

4. Apparatus as claimed in claim 1 or 2, in which there is provided a plurality of panels arranged on one or more groups, the panels of each group being attached together in the manner of a concertina.

5. Apparatus as claimed in any preceding claim, in which the penetration-resistant material is metal.

6. Apparatus claimed in any preceding claim, in which a support is provided on said internal surface and in which support the or each panel is received in the closed position.

7. Apparatus as claimed in claim 6, in which there is provided means for securing the or each panel to said support in the closed position.

8. Apparatus as claimed in claim 7, in which the securing means secures the layer of penetration-resistant material to the support.

9. Apparatus as claimed in claim 7 or 8 wherein the securing means acts to increase securing action when pressure is applied to the or each panel on the exterior side thereof.

10. Apparatus as claimed in any of claims 7 to 9, in which the securing means comprises a closure member provided on the support and pivotable or bendable about an axis substantially parallel to a top or bottom edge of the or each panel in the closed position.

11. Apparatus as claimed in any of claims 7 to 10 in which there is provided a spring operable to bias the securing means into an operative position when the or each panel is in the closed position, but operable when pressure is applied on an interior suraface of the or each panel to bias the securing means away from the operative position.

12. Apparatus as claimed in any preceding claim, in which the sealing means is provided by a flexible draught-proof seal having at least one magnetic sealing member mounted on one of the frame or the or each panel, the sealing member being attracted by the other of the frame or the or each panel.

13. Apparatus as claimed in claim 12, in which the draught-proof seal is in the form of a continuous deformable bellows.

14. Shutter apparatus substantially as hereinbefore described with reference to the accompanying drawings.

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